1991

# Description of Study Area

Mitchell D. Norman
*Virginia Department of Game and Inland Fisheries*

# Description of Study Area

Mitchell D. Norman

Virginia Department of Game and Inland Fisheries
4010 West Broad Street, Richmond, Virginia 23230-1104

Back Bay is the northern most of a series of bays along the Atlantic seaboard of North Carolina and Virginia. Other large bays in this complex include Currituck, Pamlico and Albemarle Sounds in North Carolina. Back Bay is confined within the City of Virginia Beach, Virginia and located between 75 deg. 52-58 sec. W log. and 36 deg. 32-45 sec. N lat. The Back Bay system is divided by islands into seven smaller segments: Back , Buzzards, Half Moon, Sand, Redhead, Shipps and North Bays (Figure 1).

Physiographically, Back Bay lies in the Atlantic Coastal Plain and in the section of Virginia referred to as Tidewater. The physiography of the watershed was first defined by Clark and Miller (1906, 1912) as lying within the Talbot terrace, which extended east from the Atlantic Ocean to a scarp near Suffolk. Stephenson (1912, 1926) subdivided the Talbot terrace into the Chowan terrace in the west, between elevations of 12.1 m and 15.2 m, and the Pamlico terrace in the east, below 12.1 m. Wentworth (1930) later subdivided the Pamlico terrace into the Dismal Swamp terrace in the west and the Princess Anne terrace in the east and north. Wentworth described the Princess Anne terrace, in which Back Bay was located, as a low, flat plain to an elevation of 3.0 m and entirely east of a prominent northward-trending ridge to Oceana, except for a small reentrant that extended westward in the vicinity of the community of Princess Anne. Wentworth named this ridge the Princess Anne scarp. However, Oaks and Coch (1973) pointed out that the Princess Anne scarp was actually two intersecting ridges of different ages, which they named Oceana ridge on the north and Pungo ridge on the south. Oaks and Coch abandoned the morphologic subdivisions of Dismal Swamp terrace, Princess Anne terrace and Princess Anne scarp submitted by previous researchers because of their confused definitions and their failure to adequately describe the morphology in detail. They redefined the Princess Anne scarp and Princess Anne terrace of Wentworth as simply "Sand-ridge and Mud-flat complex." The barrier dunes, marsh, swamp and stream sediments within the Back Bay watershed were redefined as "undivided sediments."

The Back Bay watershed system consists of approximately 27,024 ha (Mann, 1984). Upland vegetative communities and wetlands compose approximately 40% and 22%, respectively, of the watershed. Lakes, ponds and the waters of Back Bay comprise the remaining 38%. The eastern margin of the watershed consists of a narrow zone of marshlands and sand dunes which form a barrier between the bay and the Atlantic Ocean. This marsh-sand dune barrier varies in width from approximately 200 m along the bay's northeastern section (Sandbridge) to 1.1 km in the southeastern section where an extensive marsh system was formed by the shoaling in of Old Currituck Inlet during the early 1700's. Extensive wetlands, composed of slightly brackish to fresh water plants, border the western margin. The wetland plants of Back Bay are discussed in detail by other authors in this proceedings.

Hatch et al. (1985) mapped the soils of Virginia Beach as a revision of a soil survey done by Simmons and Shulkcum (1945). Hatch et al. reported six soil types within the Back Bay watershed. These were: 1) Back Bay-Nawney - very poorly drained soils with a thin organic surface layer over a loamy substratum; formed in fluvial sediments; consists of nearly level, frequently flooded soils on the floodplains of Back Bay and its tributaries; found in the marshes, floodplains and wooded drainageways of Back Bay, 2) Newhan-Duckston-Corollla - excessively drained to poorly drained soils with a sandy substratum; formed in marine and aeolian sediments; consists of nearly level to steep, very rapidly permeable soils on grass- and shrub-covered sand dunes, flats, and depressions along coastal areas; found in the barrier sand dunes, 3) Acredale-Tomotley-Nimmo - poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments; consists of nearly level soils in broad flat areas; found between Pungo Ridge and the Back Bay-Nawney soils, 4) State-Tetotum-Augusta - well drained, moderately well drained, and somewhat poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments; consists of nearly level to gently sloping soils on broad ridges and side slopes; found mainly in the northern part of the watershed, 5) Dragston-Munden-Bojac - somewhat poorly drained, moderately well drained, and well drained soils that have a loamy subsoil;

formed in marine and fluvial sediments; consists of areas of nearly level soils on narrow ridges and side slopes; found scattered along the western and northern portions of the Back Bay watershed above the Back Bay-Nawney soil type, and 6) Udorthents- Urban Land - well drained or moderately well drained soils over a loamy substratum and are covered by buildings and roads; consists of nearly level to steep soils in urban areas that have been excavated and graded or covered by impervious material.

The climate at Back Bay is temperate and oceanic, eg. it is moderated by the proximity of the Atlantic Ocean and Chesapeake Bay. The annual mean temperature, as determined at the nearest US Weather Station (Norfolk, Va), is 15.2 C. The coldest and warmest months are February and July with mean temperatures of 5.2 and 25.7 C, respectively. The average frost free season is 245 days, March 20 to November 20 (Simmons and Shulkcum, 1945). Rainfall is moderate (113.5 cm) and well distributed throughout the year (Norfolk station records). Months with the greatest rainfall are July and August (14.5 and 15.0 cm, respectively). Wind direction and speed determined at Oceana Naval Air Station was presented by Mann (1984). From April and continuing into October, wind direction is predominantly from the south-southwest. Wind direction from October through March is predominantly from the west-southwest and north. Wind velocities of 48 kph are uncommon. The average annual wind speed is 9.2 kph. Average monthly wind speed is highest in March (11.1 kph) and lowest in August (7.2 kph).

Major tributaries of Back Bay include Nawney Creek, Beggards Bridge Creek, and Ashville Bridge Creek with its Hell Point Creek diversion canal. Mann (1984) calculated the water budget for each subwatershed within the Back Bay system. The three major tributaries comprised the following percentages of the annual water budget for the total watershed: Ashville Bridge/ Hell Point Creek, 30.4%; Nawney Creek, 17.1%; and Beggars Bridge Creek, 7.7%.

Back Bay is an expansive, flat-bottomed, shallow-water aquatic ecosystem. It is comprised of approximately 9960 ha of open water and 4596 ha of emergent vegetated wetlands (Mann, 1984). Estimated maximum dimensions are 11.7 km in length by 9.6 km in width at southern end and 1.2 km in width at northern end. Shoreline irregularities cause considerable variance from these dimensions. The average depth of the entire Back Bay complex is 1.3 m. The maximum depth is 3.0 m, which is found in the channel (Great Narrows) separating North Bay and Redhead Bay. The remainder of the bay is less than 2.5 m. deep. Water depth is greatly influenced by winds, especially from the northeast, which may alter the depth by as much as 1.0 m. Lunar tides have little if any effect on the water level in Back Bay.

By strict definition Back Bay would be presently classified as an oligohaline estuary. The salinity presently ranges from 0.5 to 1.0 ppt The only saltwater influence is water blown north from Currituck Sound. Back Bay's nearest outlet to the ocean is approximately 43 km south at Oregon Inlet. The only significant connection between Back Bay and Currituck Sound is Knotts Island Channel, east of Knotts Island which sits astride the Virginia-North Carolina border. An insignificant connection is Corey's Ditch, which cuts through a vegetated wetland west of Knotts Island. Corey's Ditch was excavated in 1920 to permit water exchange between Back Bay and Currituck Sound west of Knotts Island, which had been cut off in 1890 by the construction of a causeway connecting Knotts Island with the mainland.

Public lands within the Back Bay watershed include two National Wildlife Refuges (Back Bay and Mackay Island), three Virginia Wildlife Mangement Areas (Trojan, Pocahantas, and Barbour's Hill Waterfowl Areas), one Virginia State Park (False Cape), and two Virginia Beach City Parks (Little Island and Creeds).

**Literature Cited**


Clark, W. B. and B. L. Miller. 1906. Geology of the Virginia Coastal Plain, in the Clay deposits of the Virginia Coastal Plain: Va. Geol. Sur. Bull. 2, p. 11-24.

———, 1912. The physiography and geology of the Coastal Plain province of Virginia. Va. Geol. Sur. Bull 4, 274 pp.

Hatch, D. R., J. E. Belshan, S. M. Lantz, G. R. Swecker and D. E. Starker. 1985. Soil Survey of the City of Virginia Beach, Virginia. Virginia Polytechnic Institute and State University and US Soil Conservation Service. 131 pp.

Mann, R. and Assoc., Inc. 1984. A Management Plan for the Back Bay Watershed. Prepared for the Ciy of Virginia Beach, Va. by Ron Mann and Assoc., Inc. Boston, Ma.

Oaks, R. Q.,Jr. and N. K. Coch. 1973. Post-Miocene Stratigraphy and Morphology, Southeastern Virginia. Va. Div. of Mineral Resources, Bull. 82, 135 pp.

Simmons, C.S. and E. Shulkcum. 1945. Soil Survey - Princess Anne County, Virginia. U.S. Dept. of Agriculture, 57 pp.

Stephenson, L.W. 1912. The Coastal Plain of North Carolina: the Cretaceous, Lafayette, and Quaternary Formations. N.C. Geol. Survey Bull., 3.

———. 1926. Major Features in the Geology of the Atlantic and Gulf Coastal Plain. Washington Acad. Sci., Jour., vol. 16: 460-480.

Wentworth, C.K. 1930. Sand and Gravel Resources of the Coastal Plain of Virginia. Va. Geol. Survey Bull. 32, 146 pp.

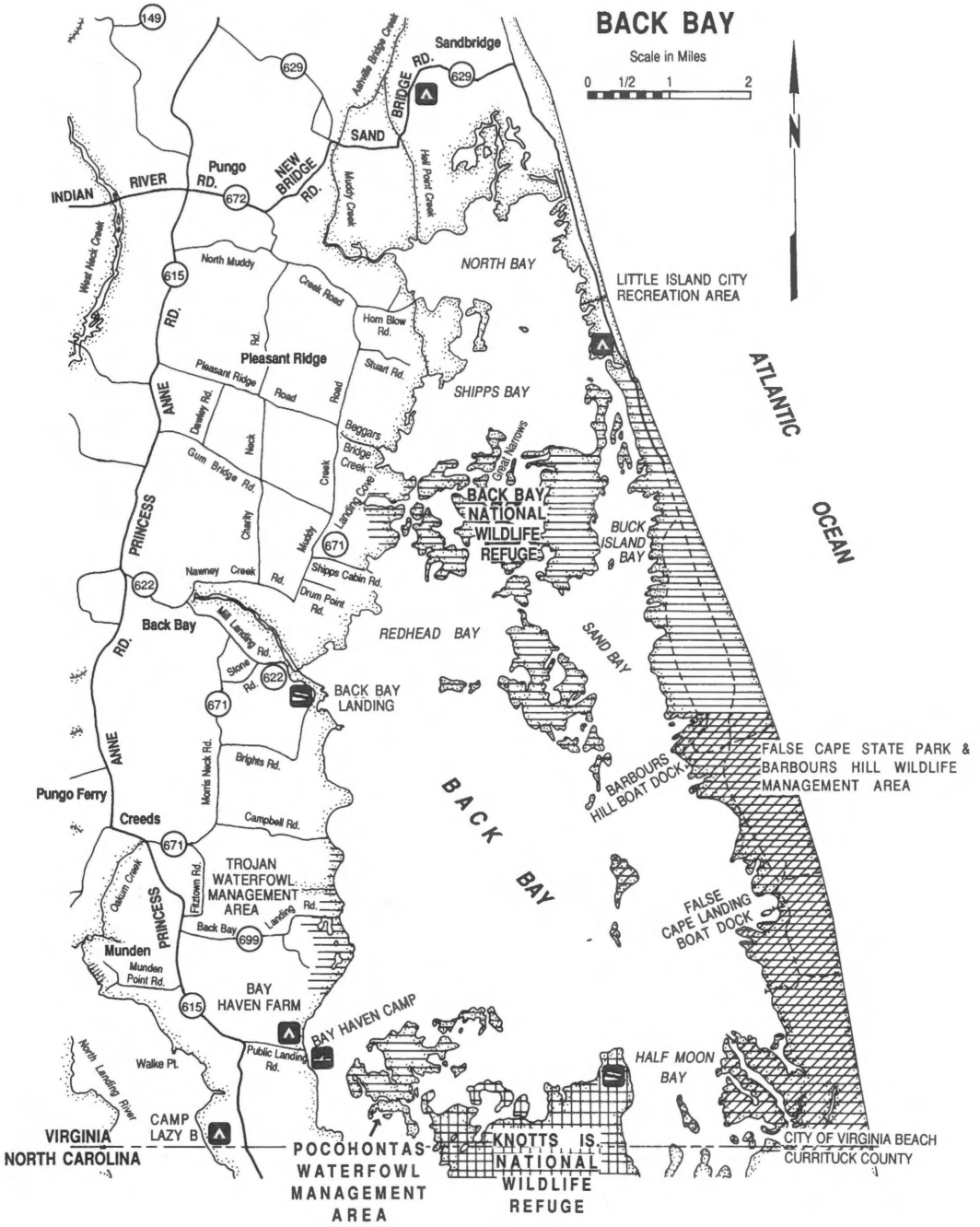


**Figure 1.** Map of Back Bay, Virginia.